



ATTACHMENT 2
KANSAS CITYS, MISSOURI AND KANSAS
SUMMARY TABLE OF ECONOMIC DATA AND METHODOLOGIES

Data Item	Master List Business (Com, Ind, Pub) Survey Form Returned	Master List Business (Com,Ind,Pub) Survey Form Not Returned	Rest of Study Area Com, Ind, Pub	Rest of Study Area Warehouse (based on square footage of warehouse space per block or partial block, or parcel, if at same elevation and not unique)	Residential (based on groups of like structures at the same elevation in a square block or partial block unless unique)
Levee Unit/River Mile	R.M. (in tenths) assigned from levee unit map and building footprint as identified in windshield survey	R.M. (in tenths) assigned from levee unit map and building footprint as identified in windshield survey	R.M.(in tenths) assigned from levee unit map and building footprint as identified in windshield survey	R.M. (in tenths) from levee unit map and building footprints in square block of warehouse development as identified in EFS Phase 1 notes and EFS Phase 2 Task 3 windshield survey	R.M. (in tenths) from levee unit map, building footprints and block number identified in residential windshield survey
Building Number	Assigned building footprint # from map combined w/levee abbrev., or one # was assigned for a group of bldgs.	Assign building footprint # from map, combined w/ levee abbrev., or one # is assigned for a group of bldgs.	Assign building footprint # from map, combined w/ levee abbrev., or one # is assigned for a group of bldgs.	Number assigned for each individual structure, block or group of warehouse development located at the same elevation	Block or partial block of residential structures identified/numbered on study area maps during residential windshield survey
Damage Category (Com, Ind, Pub, Res)	Selected based on name or nature of business as provided in survey form	Selected based on name or nature of business from EFS Phase 1 field notes; verified in Phase 2 Task 2 visual observation	Visual observation during EFS Phase 2 Task 3 windshield survey; comparison to similar businesses in the study area	Warehouse as determined in EFS Phase 2 Task 3 windshield survey and EFS Phase 1 notes	All residential
No. of Bldgs on site	As identified in survey form	As identified in EFS Phase 1 or Phase 2 Task 2 windshield survey and in conjunction with study area maps, building footprints, parcels	As identified in EFS Phase 2 Task 3 windshield survey and in conjunction with study area maps, building footprints, parcels	As identified in EFS Phase 2 Task 3 windshield survey and in conjunction with study area maps, building footprints, parcels	N/A--garage included in structure value
Structure ground dmg elev	Survey form or study area map building footprint, contour lines, and spot elevations	Study area map building footprint, contour lines, and spot elevations	Study area map building footprint, contour lines, and spot elevations	Study area map building footprints and contour lines, spot elevations	From predominant elevation of block locations on study area maps, considering contour lines, spot elevations
First floor above ground/ Elev of Lowest Opening	Survey form or EFS Phase 1 or Phase 2 Task 2 visual observation	EFS Phase 1 or Phase 2 Task 2 visual observation	EFS Phase 2 Task 3 windshield survey	EFS Phase 2 Task 3 windshield survey, and comparison with what is typical for warehouses that returned survey forms	Based on visual observation during residential windshield survey
Approx bldg sq ft, type of constr mat'l, approx age	Survey form and building footprint mapping	Building footprint mapping sq ft, EFS Phase 2 Task 2 windshield survey, available descriptive GIS data	Building footprint mapping sq ft, EFS Phase 2 Task 3 windshield survey, available descriptive GIS data	Building footprint mapping sq ft, EFS Phase 2 Task 3 windshield survey, available descriptive GIS data	Visual observation during windshield survey
Estimated depreciated replacement value of bldg	Survey form value or based on square footage, effective age, condition, constr mat'l, Marshall & Swift depreciated replacement value	Estimated value based on square footage and valuation data for similar business in study area (similar type, similar square footage, effective age, condition, constr mat'l) or by Marshall & Swift typical value	Marshall & Swift typical value or estimated based on square footage and valuation for similar business in study area (similar type, similar square footage, effective age, condition, constr mat'l)	Based on value per square foot from study area warehouse survey data received; or based on estimate using similar square footage, effective age, condition, constr mat'l or by Marshall & Swift typical value	Initial estimates based on surveyor's real estate market experience during windshield survey. Contact local realtors for typical market value of different types of residences in each area, and also for min and max values for each type; compare values with Marshall and Swift valuations based on square feet, effective age, condition, etc. to verify accuracy
Elev at which damages to contents begin	Survey form or by visual observation	Assumed to be same as first floor above ground or elev of lowest opening	Assumed to be same as first floor above ground or elev of lowest opening	Visual observation; or typical for warehouse development as obtained from study area warehouse completed survey forms	Same as first floor above ground if no basement/ or elev of lowest opening
Content Value (Inventory) and Other Value (Computers, Equip., Mach., Misc.)	Survey form	use a content to structure value ratio based on survey data from those businesses with same NAICS code that returned survey forms; or Marshall & Swift valuation for a typical similar business (CCI program)	Marshall & Swift typical value using Commercial Contents & Inventory (CCI) program or unit value per square foot based on surveys from similar businesses	Use a content to structure value ratio based on study area warehouse data received in completed survey forms (uncertainties will be higher for these values)	Use data from EM 1110-2-1619 Table 6-4 if IWR depth damage curves are not used; N/A if IWR curves are used
Floor Location of Content/Other Investment (beginning damage elevation for contents)	Survey form	Assumed to be same as first floor above ground; comparison with businesses with same NAICS code that returned survey forms	Assumed to be first floor above ground, comparison with businesses surveyed in other Corps studies	Estimated based on study area warehouse completed survey forms	N/A
Structure Occupancy Type	Direct from survey form	NAICS code determined during EFS Phase 2 Task 1	NAICS code determined after windshield survey, descriptive info	NAICS code determined after windshield survey, descriptive info	1wb, 1nb, 2wb etc. as determined from residential windshield survey

Attach 2 Continued-- Data Item	Master List Business (Com, Ind, Pub) Survey Form Returned	Master List Business (Com,Ind,Pub) Survey Form Not Returned	Rest of Study Area Com, Ind, Pub	Rest of Study Area Warehouse (based on square footage of warehouse space per block or partial block, or parcel, if at same elevation and not unique)	Residential (based on groups of like structures at the same elevation in a square block or partial block unless unique)
Structure Depth-Damage Function	Survey form or application of existing Corps District structure depth percent damage curves (based on type of construction material) to structure value	Application of depth damage function developed from survey data from other businesses with same NAICS code and constr mat'l. that returned surveys or application of existing NWK/other Corps district structure depth percent damage curves (based on type of construction material) to structure value	Use MVN, NWK, or other Corps district structure depth percent damage curves; investigate available IWR commercial curves	Use depth damage curves from study area warehouse survey forms returned	For NB structures, use IWR depth damage functions; for WB structures use other Corps District functions
Content (Inventory) and Other (Equip, Mach., Misc.) Depth Damage	Most likely damage from survey form; or application of depth damage function developed from survey data for other similar businesses that returned surveys; compare with/use existing Corps district content depth percent damage curves for similar businesses	Application of depth damage function developed from survey data from other businesses with same NAICS code that returned surveys; or application of existing Corps district depth percent damage curves for contents in a similar type of business	Use existing Corps district content depth percent damage curves (MVN etc.); investigate any available IWR commercial content curves and use as appropriate	Use depth damage curves from study area warehouse survey forms returned	For no basement homes, IWR curves applied to structure value account for both structure and content damage. For with basement homes, use content value to structure value ratios from EM 1110-2-1619, Table 6-4, and apply NWK/MVN/ other district depth percent damage curves
Descriptive Data: Name, Address, Phone, Type of Business, Historical Info, Notes and Comments	Survey form, windshield survey, and EFS Phases 1 and 2 notes	Windshield survey and EFS Phase 1 and 2 notes	Windshield survey and EFS Phase 1 notes	Windshield survey and EFS Phase 1 notes	Residential windshield survey
UNCERTAINTIES:					
Depreciated structure value Uncertainties	Compare survey data estimate with sample Marshall & Swift valuation; compute standard deviation	Use std.dev. developed for Master List businesses that returned surveys	Use std.dev. developed for Master List businesses that returned surveys; use broader ranges of values or larger standard deviations as necessary to account for greater uncertainty	Compare warehouse returned survey data with Marshall & Swift typical values based on square feet, etc.	Investigate and obtain typical market values for different types of structures from local realtors (less land value); use triangular distribution and a range of minimum and maximum values
Content value Uncertainties	Estimate standard deviation using data from similar businesses if available, or estimate standard deviation based on content to structure value for similar businesses as appropriate	Estimate std. dev. using data from similar businesses if available, or estimate std. dev. based on content to structure value for similar businesses as appropriate; use broader ranges of values or larger standard deviations as necessary to account for greater uncertainty	Estimate std. dev. using data from similar businesses if available, or estimate std. dev. based on content to structure value for similar businesses as appropriate; use broader ranges of values or larger standard deviations as necessary to account for greater uncertainty	Compare warehouse returned survey data with Marshall & Swift CCI typical values for warehouse content.	For NB structures use IWR std. dev.; for WB structures use content to structure value ratio from guidance, and associated std. dev. from guidance (EM 1110-2-1619)
Other value Uncertainties	Same procedure as for content	Same procedures as for content	Same as for content	Same as for content	N/A
Struc Elev. Or Beg. Dmg. Elev Uncertainties	Per guidance for 2 & 4 foot contours (EM 1110-2-1619)	Per guidance for 2 & 4 foot contours (EM 1110-2-1619)	Per guidance for 2 & 4 foot contours (EM 1110-2-1619)	Per guidance for 2 & 4 foot contours (EM 1110-2-1619)	Per guidance for 2 & 4 foot contours (EM 1110-2-1619)
Depth Damage Function Uncertainties	Use survey min and max damage per foot if provided (triangular distribution); or compare data for similar business in study area with existing Corps district depth damage functions for a similar type of business and develop uncertainty; use broader ranges of values or larger standard deviations as necessary to account for greater uncertainty	Use survey min and max damage per foot if provided (triangular distribution); or compare data for similar business in study area with existing Corps district depth damage functions for a similar type of business and develop uncertainty; use broader ranges of values or larger standard deviations as necessary to account for greater uncertainty	Use survey min and max damage per foot if provided (triangular distribution); or compare data for similar business in study area with existing Corps district depth damage functions for a similar type of business and develop uncertainty; use broader ranges of values or larger standard deviations as necessary to account for greater uncertainty	As provided in study area warehouse survey forms returned	IWR no basement curve std. dev.; existing Corps district depth damage functions and associated uncertainties for with basemenet structures unless IWR curves are released and available

U.S. Army Corps of Engineers
Kansas City District

Levee Unit CID

Feasibility Study:
Flood Damage Reduction in
The Kansas City, Missouri and Kansas
Metropolitan Area

River Mile _____

Bldg # _____

Map _____

COMMERCIAL INDUSTRIAL PUBLIC (Circle appropriate category)

Name of Firm _____ **ATTACH BUSINESS CARD**

Street Address _____

Town & State _____

Name of Person Interviewed: _____

Title _____

Telephone # _____

Type of Business _____

Total Number of Buildings on Site: _____ (If more than one, use additional sheets.)

STRUCTURE:

Ground Dmg Elev _____ First Floor Above Ground _____ Elev of Lowest Opening _____

Approx Bldg Sq.Ft. _____ Type of Constr. Mat'l. _____

Approx Age/Year Constructed _____ Condition: Excellent Good Fair Poor

Estimated depreciated replacement value of Building \$ _____ (exclude land value)

Range: \$ _____

CONTENTS:Elevation at which damages to contents begin _____ feet + or – from 1st floor elevation**Estimated Content Values**

	Basement	First Floor	Second Floor & Above	Total
INVENTORY VALUE				
Value of Office Equip & Computers				
Machinery/Production Equipment Value				
Other/Misc (describe)				
SUBTOTAL EQUIP/MACH/OTHER	N/A	N/A	N/A	

continued on other side

ESTIMATES OF FLOOD DAMAGES

Depth of Flooding on First Floor	Structure Damages			Inventory Damages			Equip, Mach, Other Damages		
	Least Possible Damage	Most Likely Damage	Maximum Possible Damage	Least Possible Damage	Most Likely Damage	Maximum Possible Damage	Least Possible Cost	Most Likely Cost	Maximum Possible Cost
+1 ft									
+2 ft									
+3 ft									
+4 ft									
+6 ft									
+8 ft									
+10 ft									
+12 ft									

HISTORICAL INFORMATION:

Date of Last Flooding _____ Depth of Flooding _____

Amount of damage caused by flood: \$ _____ Total
 \$ _____ Structure
 \$ _____ Inventory
 \$ _____ Equipment
 \$ _____ Other

COMMENTS:

COMMERCIAL/INDUSTRIAL/PUBLIC FLOOD DAMAGE SURVEY

(personal interview)
 OMB 0710-0001

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Hydraulic overtopping: Description of Arg Unit Low Point

776.0 ft msl (at index point)

Argentine Floodwall and Levee Embankment Features

Structural P of F

Elev	Prob
764.0	0.00
768.7	0.00
775.9	0.01
776.8	0.03
777.6	0.13

Geotechnical P of F

Elev	Prob
764.0	0.00
768.7	0.00
775.2	0.15
775.9	0.32
776.8	0.52
778.0	0.79

Strong Ave. Pump Station

Structural P of F

Elev	Prob
764	0.00
767.6	0.15
768.7	0.25
775.2	0.85
775.9	0.92
776.8	1.00

Argentine Pump Station

Structural P of F

Elev	Prob
764	0.00
767.3	0.15
768.1	0.25
771.0	0.51
774.8	0.85
775.9	0.92
776.8	1.00

Equation:

$$Pr(f)=1-(1-p1)(1-p2)(1-p3)(1-p4)$$

ETL 1110-2-556

Combined P of F

Exist Cond Comb Prob of Failure (HEC-FDA Input)	
Elev	Prob of Fail
764.0	0.000
766.7	0.15
768.7	0.48
772.8	0.85
775.9	0.997

HEC-FDA outputs	Reach Index Point	Adjusted Top of Levee Elevation at Index Point	Reliability Against 1% Exceedance Probability Event
	R.M. 9.65		769.6 wsel
Existing Condition	Reliability against Overtopping Only	776.0	0.91
Existing Condition	Overall Reliability	776.0	0.49
With Arg Nom 500+0 Raise	Overall Reliability	778.2	0.95
With Arg Nom 500+3 Raise	Overall Reliability	781.2	0.99
With Arg Nom 500+5 Raise	Overall Reliability	783.2	0.99
With Arg Pump Sta & Embankment Solutions, No Raise	Overall Reliability	776.0	0.90

With Proj Cond Combined Prob of Failure (HEC-FDA Input)		
Nom 500+0	Elev	Prob of Fail
	764.0	0.00
	768.7	0.00
	775.2	0.00
	778.1	0.01
Nom 500+3	Elev	Prob of Fail
	764.0	0.00
	768.7	0.00
	778.2	0.00
	781.1	0.01
Nom 500+5	Elev	Prob of Fail
	764.0	0.00
	768.7	0.00
	780.2	0.00
	783.1	0.01
No Raise, Pump Sta & Earthwork	Elev	Prob of Fail
	764.0	0.00
	768.7	0.00
	774.5	0.00
	775.9	0.01
NED Plan: Nom 500+3		
Geotech and Struc Reliability Objective: 99.8% at top of levee		

Hydraulic overtopping: Description of Ftx-JC Unit Low Point

760.5 ft msl (at index point)

BPU Floodwall AOI

Structural P of F

Elev	Prob
756.3	0.00
757.3	0.02
758.3	0.06
758.8	0.23
759.3	0.43
760.3	0.96
761.3	1.00

Geotechnical P of F

Elev	Prob
756.3	0.00
757.3	0.00
758.3	0.00
758.8	0.00
759.3	0.00
760.3	0.00
761.3	0.00

Combined Structural & Geotechnical P of F

Equation:

$$Pr(f)=1-(1-p_G)(1-p_S)$$

ETL 1110-2-556

Combined P of F

Equation:

$$Pr(f)=1-(1-p_1)(1-p_2)(1-p_3)$$

ETL 1110-2-556

JC Sheetpile Wall and Wharf Area AOI

Structural P of F

Elev	Prob
740.0	0.00
757.3	0.00
758.3	0.00
758.6	0.00
760.0	0.00

Geotechnical P of F

Elev	Prob
740.0	0.00
750.0	0.02
755.0	0.40
757.3	0.40
758.8	0.40
760.0	0.40

Combined Structural & Geotechnical P of F

Equation:

$$Pr(f)=1-(1-p_G)(1-p_S)$$

ETL 1110-2-556

Floodfight 2 locations at Lower End of Unit

P of F Lower Tieback Floodfight

Elev	Prob
740.0	0.00
757.3	0.00
758.3	0.00
758.8	0.00
760.5	0.35

Combined P of F

Equation:

$$Pr(f)=1-(1-p_1)(1-p_2)$$

ETL 1110-2-556

P of F JC Outlet Floodfight

Elev	Prob
740.0	0.00
757.3	0.00
758.3	0.00
758.8	0.00
759.8	0.00
760.5	0.10

HEC-FDA outputs			
	Reach Index Point	Adjusted Top of Levee Elevation at Index Point	Reliability Against 1% Exceedance Probability Event
	R.M. 367.7		751.5
Existing Condition	Reliability against Overtopping Only	760.5	0.99
Existing Condition	Overall Reliability	760.5	0.82
With BPU Floodwall Fix and JC Sheetpile Wall AND Wharf Area Fix	Overall Reliability	760.5	0.99
With ONLY BPU Floodwall Fix	Overall Reliability	760.5	0.82
With ONLY JC Sheetpile Wall & Wharf Area Fix	Overall Reliability	760.5	0.98

NOTE: Reliabilities assume successful floodfight at Lower Tieback and at JC Outlet

Exist Cond Comb Prob of Failure (BPU Floodwall & JC Sheetpile Wall/Wharf Area and Floodfight 2 sites (HEC-FDA Input)	
Elev	Prob of Fail
740.0	0.00
750.0	0.02
751.7	0.15
755.0	0.40
756.3	0.40
757.3	0.41
758.3	0.44
759.3	0.69
759.8	0.85
760.0	0.90
760.4	0.99

With Proj Cond Combined Prob of Failure (BPU Floodwall & JC Sheetpile Wall /Wharf Area Fixes; residual risk at 2 (HEC-FDA Input)	
Elev	Prob of Fail
757.0	0.00
758.3	0.00
759.8	0.21
760.0	0.27
760.4	0.39
Recommended Plan: JC New Channel Wall (Open Cell Tech) and BPU Addl Row of Piles, Landward Side of Pile Cap Geotech & Struc Reliability Objective: 99.8% at top of levee/floodwall	

Hydraulic overtopping: Description of NKC Unit Low Point

755.5 ft msl (at index point)

HARLEM AOI

Structural P of F

Elev	Prob
742.6	0.0
745.0	0.0
750.0	0.0
754.0	0.0
755.4	0.0

Combined Structural &
Geotechnical P of F
Equation: $\Pr(f)=1-(1-pG)(1-pS)$
ETL 1110-2-556

Geotechnical P of F

Elev	Prob
742.6	0.00
745.0	0.00
750.0	0.11
750.7	0.15
754.0	0.34
755.4	0.42
759.6	0.64

Combined Structural & Geotechnical P of F

Equation: $\Pr(f)=1-(1-p1)(1-p2)$
ETL 1110-2-556

NATIONAL STARCH AOI

Structural P of F

Elev	Prob
742.6	0.00
745.0	0.00
750.0	0.00
754.0	0.00
755.4	0.00

Combined Structural &
Geotechnical P of F
Equation: $\Pr(f)=1-(1-pG)(1-pS)$
ETL 1110-2-556

Geotechnical P of F

Elev	Prob
742.6	0.00
745.0	0.00
750.0	0.04
752.4	0.15
754.0	0.25
755.4	0.35
759.7	0.63

HEC-FDA outputs	Reach Index Point	Adjusted Top of Levee Elevation at Index Point	Reliability Against 1% Exceedance Probability Event
	R.M. 365.82		748.8
Existing Condition	Reliability against Overtopping Only	755.5	0.98
Existing Condition	Overall Reliability	755.5	0.85
With Harlem Fix AND National Starch Fix	Overall Reliability	755.5	0.98
With Harlem Fix Only	Overall Reliability	755.5	0.93
With National Starch Fix Only	Overall Reliability	755.5	0.88

Exist Cond Comb Prob of Failure (Harlem & Nat'l Starch) (HEC-FDA Input)	
Elev	Prob of Fail
742.6	0.00
745.0	0.00
750.1	0.15
754.0	0.50
755.4	0.63

With Proj Cond Combined Prob of Failure (Harlem & Nat'l Starch Fixes) (HEC-FDA Input)	
Elev	Prob of Fail
742.6	0.00
745.0	0.00
750.0	0.00
754.0	0.00
755.4	0.00
Recommended Plan: Harlem Buried Collector System and Nat'l Starch Relief Well System	
Geotech and Struc Reliability Objective: 99.8% at top of levee	

RELIABILITY ANALYSIS FLOWCHART: East Bottoms Unit

6-May-2006

Hydraulic overtopping: Description of EB Unit Low Point

746.3 ft msl (at index point)

BAYER SITE AOI

Structural P of F

Elev	Prob
729.0	0.00
736.2	0.00
739.8	0.00
743.4	0.00
746.2	0.04
746.7	0.08

Combined Structural &
Geotechnical P of F

Equation:

$$Pr(f)=1-(1-pG)(1-pS)$$

ETL 1110-2-556

Geotechnical P of F

Elev	Prob
729.0	0.00
736.2	0.01
739.8	0.06
743.4	0.13
744.3	0.15
746.2	0.20
747.0	0.22

Existing Cond Combined Prob of Failure (HEC-FDA Input)	
Elev	Prob of Fail
729.0	0.00
736.2	0.01
739.8	0.06
743.4	0.13
744.2	0.15
746.2	0.23

With Project Cond Combined Prob of Failure (HEC-FDA Input)	
Elev	Prob of Fail
729.0	0.00
736.2	0.00
739.8	0.00
743.4	0.00
746.2	0.05
Recommended Plan: Pressure Relief Wells	
Geotech Reliability Objective: 99.8% at top of levee	

HEC-FDA outputs	Reach Index Point	Adjusted Top of Levee Elevation at Index Point	Reliability Against 1% Exceedance Probability Event
	R.M. 357.63		738.3
Existing Condition	Reliability against Overtopping Only	746.3	1.00
Existing Condition	Overall Reliability	746.3	0.96
With Bayer Site Fix	Overall Reliability	746.3	0.998

RELIABILITY ANALYSIS FLOWCHART: Birmingham Unit

6-May-2006

Hydraulic overtopping: Description of Birmingham Unit Low Point

743.0 ft msl (at index point)

Birmingham Floodwall and Levee Embankment Features

Structural P of F

<i>Elev</i>	<i>Prob</i>
736.9	0.00
739.6	0.00
742.3	0.00
742.9	0.00
745.0	0.00

Combined Structural &
Geotechnical P of F

Equation:

$$\Pr(f)=1-(1-pG)(1-pS)$$

ETL 1110-2-556

Geotechnical P of F

<i>Elev</i>	<i>Prob</i>
736.9	0.00
739.6	0.00
742.3	0.00
742.9	0.04
744.9	0.15
745.0	0.16

**Existing Cond Combined Prob of Failure
(HEC-FDA Input)**

<i>Elev</i>	<i>Prob of Fail</i>
736.9	0.00
739.6	0.00
742.3	0.00
742.9	0.04

HEC-FDA outputs		Adjusted Top of Levee Elevation at Index Point	Reliability Against 1% Exceedance Probability Event
	Reach Index Point		
	R.M. 355.95		736.7
Existing Condition	Reliability against Overtopping Only	743.0	0.99
Existing Condition	Overall Reliability	743.0	0.99